

MEMORANDUM

To: Mr. T. J. Kovich,
Regional Materials Engineer,
Soils Section,
Room 134-A, Lab. Bldg.,
Downsview.

FROM: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

DATE: July 8, 1968

OUR FILE REF.

IN REPLY TO

SUBJECT:

Embankment Settlement Problems
In the Vicinity of
Station 274+00 and Station 276+00
Westbound Lane of Highway 403
1000 Ft. East of Snake Road and
Highway 403 Crossing
District No. 4 (Hamilton)
-- W.J. 68-F-56 --

Further to your memo of June 17, 1968, a site inspection and investigation have been carried out by this Section at the above mentioned location. The details are discussed herein.

Settlements have occurred along the westbound lane of Highway 403 where the embankment adjoins the natural ground in the vicinity of Stations 274+00 and 276+00. According to available information from the Maintenance Section of the Hamilton District Office, settlements have taken place over the past few years and have required periodic maintenance, especially in the vicinity of Station 274+00. The guardrail adjoining the problem areas has been deflected away from the highway towards the side slope.

In order to investigate the reasons for the settlements, 3 boreholes were put down with a Penn Drill and 4 piezometers installed in the vicinity of Station 274+00. In addition, open trenches were excavated along the north shoulder of the westbound lane between Station 273+00 and 277+00.

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The investigation revealed that the embankment material consists of weathered shale. The physical properties of this fill material are as follows:

	<u>R A N G E</u>	
	0 - 12 ft.	> 12 ft.
Standard Penetration Resistance		
'N' Values - Blows/ft.	6 - 9	26 - 50
Undrained Shear Strength		
(In-situ Vane Tests) - PSF	1460 - 1520	>2240

Based on the above values, it is concluded that the fill is poorly compacted in the upper 12 ft., being well compacted below a depth of about 12 ft. from the road surface. No groundwater was encountered within the fill. However, one piezometer in the failure area indicated a water level at elevation 339, i.e., some 10 ft. below shoulder level. At about the same elevation, water was noted seeping out through the embankment slope north of the settlement area around Sta. 274+00. By means of shallow boreholes and open trench excavations put down along the north shoulder of the westbound lane as well as in the slope of the roadside ditch, it was found that the base course beneath the shoulder in the vicinity of the grade points was saturated with water. Although the source of this water was not positively established during the investigation, it is believed that the water collected in the base course due to lack of effective drainage. Boreholes put down in the median adjacent to the problem area as well as along the south shoulder of the westbound lane, did not reveal any presence of water. It is concluded, therefore, that only a narrow portion of the north shoulder of the westbound lane is saturated with water which has percolated into the upper portions of the fill material which has subsequently been softened. Consolidation of this softened material has resulted in the observed settlement.

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It is recommended that the following remedial measures be carried out in order to minimize settlements in the affected areas:

1. The existing roadside drainage ditch for the westbound lane between Stations 278+00 to 276+00 and 274+00 to 272+00 should be subexcavated to a depth of at least 4 ft. and backfilled with G.B.C. Class 'A' material. A 6" \emptyset perforated subdrain pipe should be provided at the base of this trench and should be suitably graded. The subdrain should be connected to suitable pipes in the vicinities of Stations 274+00 and 276+00 so that erosion at the grade points is kept to a minimum.

2. Open trench excavations perpendicular to the 6" \emptyset subdrain should be carried out in such a way as to drain all the water from the sub-base beneath the shoulder into the main subdrain. These excavations should be spaced at about 10-ft. intervals between Stations 277+00 and 276+00 and Stations 274+00 and 273+00; the spacing may be increased up to 20 ft. to the west and east, respectively, of Stations 277+00 and 273+00. The details, which have already been discussed on site with Mr. D. A. Waller, Maintenance Engineer, Hamilton District, are shown on the attached sketch.

The field work, performed between June 17 - 28, 1968, was undertaken by Mr. T. Card. This memo was prepared by Mr. C. Mirza, Project Foundation Engineer.

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Mr. T. J. Kovich,
Regional Materials Engr.,
Soils Section, Downsview.

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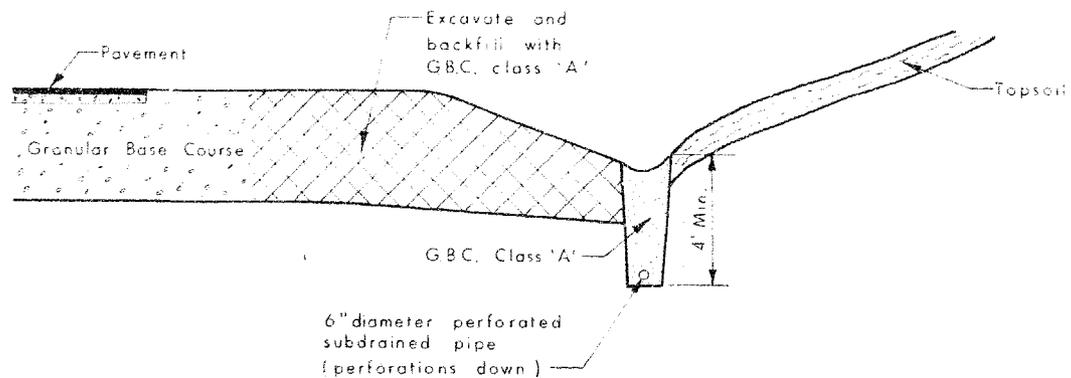
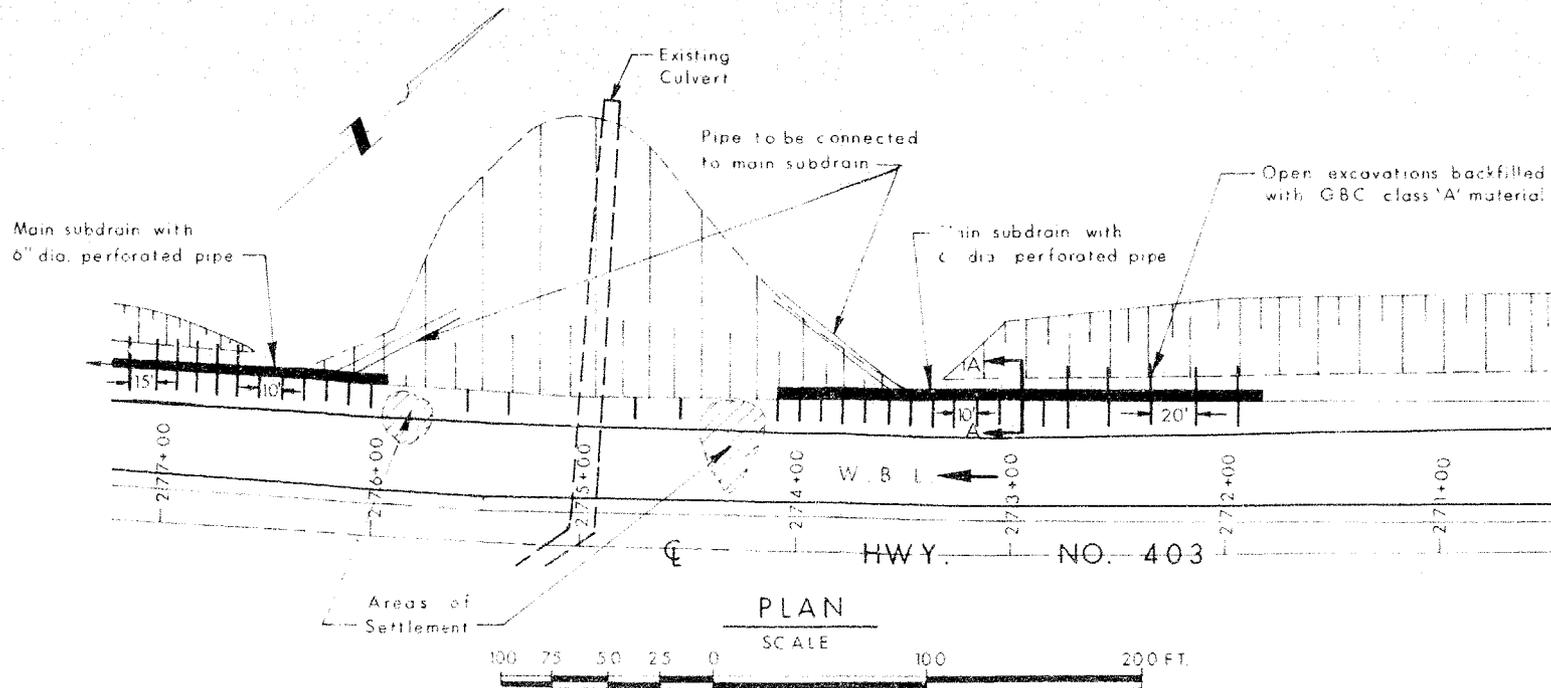
Equipment used was owned and operated by
P.V.K. & Sons Ltd.

MD/MdeF
Attach.

M. Devata
M. Devata,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

cc: Messrs. T. J. Kovich (2)
H. Greenland (2)
H. A. Tregaskes
G. K. Hunter (2)
D. M. Hopper

Foundations Files ✓
Gen. Files



SECTION A-A

N.T.S.



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

ONTARIO

EMBANKMENT SETTLEMENT HWY. 403 STA 274+00 TO 276+00

RECOMMENDED DRAINAGE INSTALLATIONS

DIST. 4

JOB NO. 68-F-56

DATE JULY 9, 1968

APPROVED

SKECH NO. 1